Non Vision-Based Lane Departure Warning System

Team Summit

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November 2009 | Senior Design Project | Howard University

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Outline

- Background
- Problem
- Design Requirements
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- 30% of all highway deaths
- LDWS reduce these numbers by 77%

Problem

- **Design an LDWS that:**
  - ☑ is non vision-based
  - ☑ has no physical external components
  - ☑ will detect impending lane departure
  - ☑ will alert driver *before* lane departure

Terms and Definitions

1. Node – point on a road showing direction
2. Time to Lane Cross (TLC) – the time before a car departs its lane

Design Requirements

- Minimum # of nodes before warning = 2
- Maximum TLC before warning issues = 1.3s
- # of nodes to buffer for LDWS response = 3
- Time between nodes = 3.2ms
- Traffic signal approach

Current Status of Art

- **2001** - Nissan included LDWS in *Cima*

- Current technology
  - vision-based
  - forward-looking

- Problems
  - Expensive
  - Bad weather?

Solution Approaches

Description:

Virtual lane determination

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Segmented road representation

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Real time displacement and time deductions

Solution Approaches

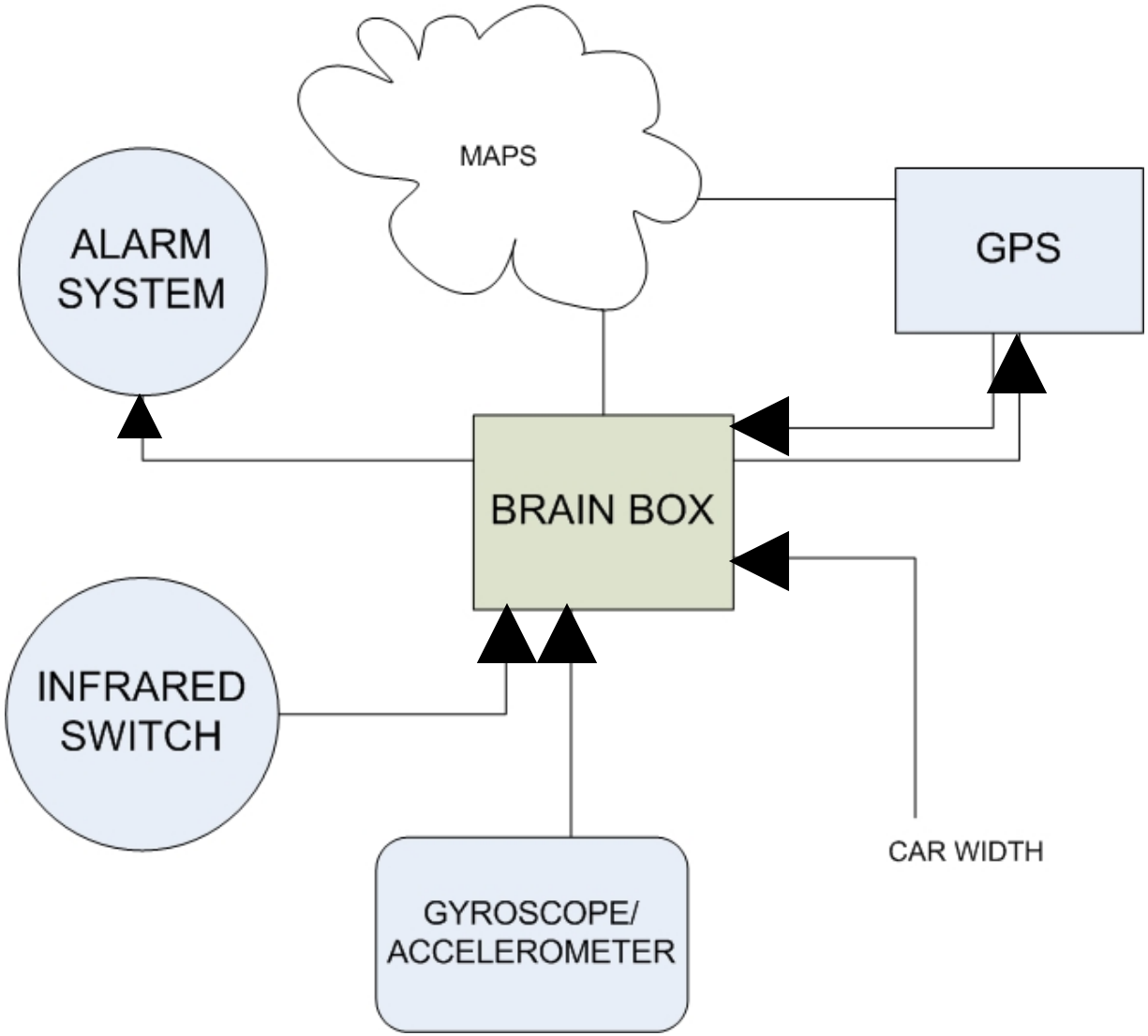
Calculations:

A. **Node Separation distance (n): Distance between each node on a given road**
B. **Time before lane departure (t)**
C. **Car width determination(w)**
D. **Displacement from nearest lane (dc)**
E. **Displacement from lane center (d)**

Solution Approaches

- **Three-phase solution:**
  1. **Routing**
     - Initialize all components
     - Draw nodes & virtual lane
  2. **Guidance**
     - Checks car & node directions
  3. **Warning**
     - Signal alarm if TLC ≤ 1.3s

Solution Approaches



Solution Approaches

Solution Approaches

Project Management

- Alternate Solution: Use of INS/DGPS
  - DGPS - determines car location
  - INS - determines car direction
- Problem
  - Expensive
  - Depends on accuracy of GPS

Solution Approaches

	Vision-based	INS/DGPS	Our Solution
Independent of physical lane markings			
Works in all weather conditions			
Accurate			
Cheapest & most affordable			
Low maintenance			
Power-efficient			
Lightweight & portable			
Convenient & easily detachable			
Non-susceptible to damage/theft			

Project Management

- **Project Manager: Funmilayo Oludaiye**
  - Provides team with vision of project objectives
  - Motivates and inspires team members
- **Software Developer: Lucky Adike**
  - Designs service applications
  - Creates programming elements
- **Research Analyst: Titilope Ogunlaja**
  - Cites datasets and conducts research
  - Ensure compliance with terms & conditions
- **Hardware Expert: Marlon McKinnie**
  - Performs design engineering tasks
  - Develops digital hardware

Project Management

No	Tasks	Start Date

Cost & Resources

Item	Price
Field Programmable Gate Array Board	$75.00
Infrared Switch & Receiver	$6.00
Remote Controlled Car	$25.00
Alarming System (LEDs & Buzzer)	$2.00
Accelerometer & Gyroscope Device	$5.00
Switching Device	$4.00
Miscellaneous	$30.00
Total	$147.00

Conclusion

- Our solution:
  - Non vision-based
  - Cost effective
  - Efficient & accurate
- Our plan:
  - Feasible
  - Reasonable constraints

Questions